

# **Integrated Support Environment (ISE) Infrastructure Summary Status and Proposed Action Plan**

(Deliverable 0421)

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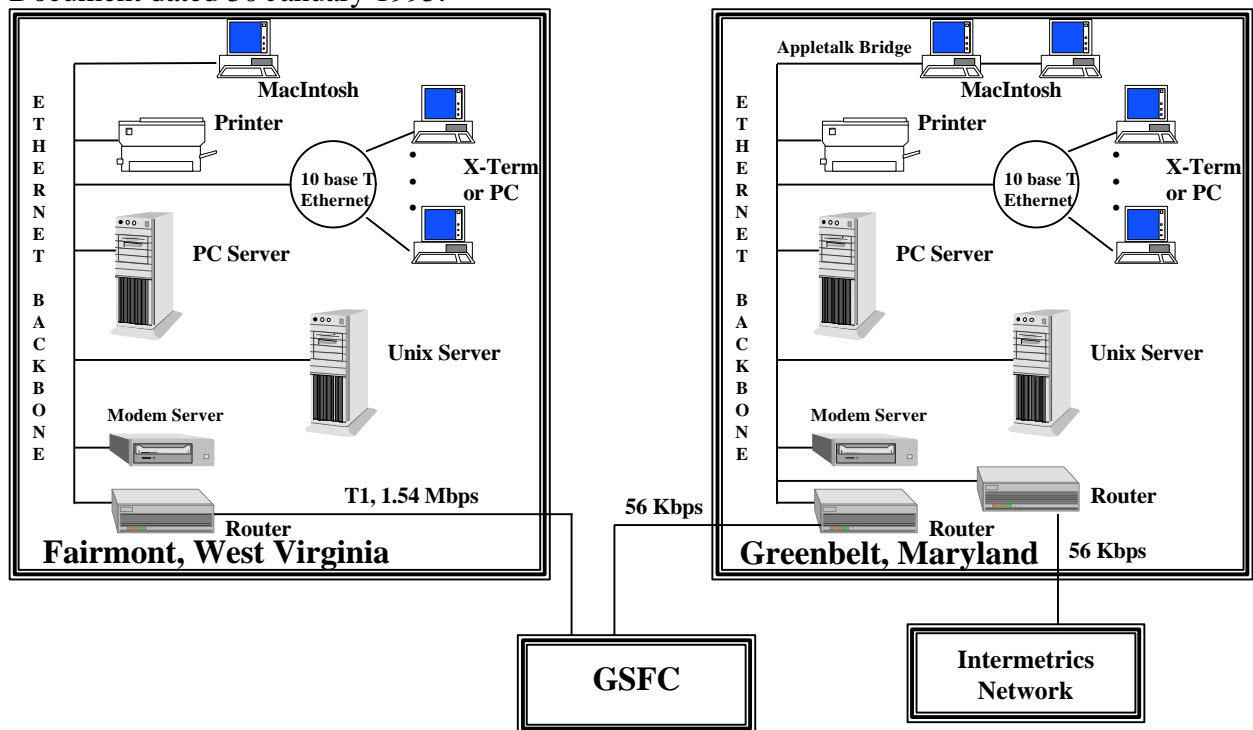
## **1. INTRODUCTION**

This report details the current status of the Integrated Support Environment (ISE) and the maintenance and enhancement activities that are anticipated over the next six to twelve months. The ISE is primarily comprised of Commercial Off-The-Shelf (COTS) products, however, the establishment of the ISE also includes developed homepages and tools. The ISE has been established and is being maintained under the Earth Observing System Data and Information System (EOSDIS) Independent Verification and Validation (IV&V) Infrastructure and Tools Development task (Task 4E). The Infrastructure and Tools Development task provides the tools and infrastructure necessary for the performance of the EOSDIS IV&V contract.

## 2. DEVELOPMENT/INFRASTRUCTURE OVERVIEW

### 2.1 ISE Infrastructure Overview

The ISE system architecture reflects a networked heterogeneous environment which is flexible and supportive for incrementally adding tools as new needs and requirements are levied against it. The ISE architecture has been detailed in the ISE System Architecture Document dated 30 January 1995.



**Exhibit 2.1-1 Network/Computational Infrastructure**

The Infrastructure and Tool Development personnel provide support for all infrastructure items. Even though several activities are defined within the Infrastructure and Tool Development task Statement of Work (SOW), the purpose of this report is to provide a summary of the infrastructure, associated version information, and insight into anticipated development and maintenance activities. Routine activities such as database reporting, RTM baseline postings, and library postings are not the primary focus of this report.

### 2.2 Tool Development Overview

Based upon identified EOSDIS IV&V tool needs, development activities are initiated when no COTS solution exists that satisfies levied requirements or selection criteria. These development initiatives have been limited to database and homepage applications thus far. However, a few small utility applications have also been created to work with ISE COTS when efforts could be streamlined by doing so. These types of applications and utilities yield benefits that automate labor intensive processing, provide support for working at geographically dispersed sites, and promote sharing of information. As a result

of these benefits, IV&V activities yield higher quality products in a more timely and efficient manner.

In the Rapid Application Prototyping and Incremental Development (RAPID) approach that is being followed, the most important and critical software requirements are defined to the extent that current knowledge and experience permits for the incremental capabilities required. After a core set of requirements are documented for an incremental capability, a “quick” functional or object oriented design addressing the current set of requirements is prepared, and a rapid prototype is developed and functionally tested. The purpose of the prototype is to gain information about the requirements and confidence in the correctness of the prototype design. Design characteristics such as efficiency, maintainability, capacity, and adaptability are also considered in the prototype since the intent is to extend the prototype to fulfill capabilities required by the target system. The developed prototype is evaluated by the end user to accumulate comments that result in the refinement of the documented requirements, design, and the prototype itself. This rapid prototyping approach is iterative and is repeated for each incremental tool capability.

### **2.2.1 Client/Server Development**

Four 4<sup>th</sup> Generation Language (4GL) client/server applications have been developed to support existing EOSDIS IV&V and EOS Ground System (EGS) Integration and Test (I&T) activities. These applications include:

- the Automated Requirements Database (ARDB),
- the Project Issue Tracking System (PITS),
- the Test Management Database (TMDB), and
- the Test Verification Database (TVDB).

These applications have been developed using the Centura (Gupta prior to 1 January 1996) SQLWindows client/server development tool. SQLWindows is a Rapid Application Development (RAD) tool which allows for rapid prototyping of the graphical user interface (GUI) using a GUI builder. Once the interface is constructed, functionality is provided to associate database data from any number of COTS database management systems with the painted interfaces. Application code is then generated by SQLWindows to build the client/server application which can be deployed at various remote sites on as many PCs as desired without run-time fees. The server databases, which include RTM/Oracle and Sybase SQL Server, reside at the NASA Software IV&V Facility in Fairmont, WV so that tool developers and database reporting support personnel have local access for performance and maintenance reasons.

Several other small data transfer utilities have also been created using SQLWindows. Basically, these utilities support the transfer of information from RTM/Oracle to Sybase and from Sybase to PC files of various formats. Some of the noteworthy data transfer utilities include EDOS-to-ISE, ECS-to-ISE, and ESDIS-to-ISE RTM transfer applications.

### **2.2.2 Homepage Development**

Two homepages, the EOSDIS IV&V and EGS I&T pages, were constructed to support the corresponding activities. They were built using Hyper Text Markup Language (HTML) and include some subordinate pages with Common Gateway Interfaces (CGI) to the server side Sybase SQL Server database. Both homepages contain a “What’s New”, Library, Contact, and Information sections. The EOSDIS IV&V homepage also contains subordinate pages for the PITS World Wide Web (WWW) Browser, the Interface Analysis Database (IADB), and the Integrated Requirements Database (IRDB). The PITS WWW Browser includes a CGI to Sybase for query and display of IV&V and Interface Control Working Group (ICWG) issues. The EGS I&T homepage contains a subordinate page referred to as the Confidence Test Program (CTP) homepage. The CTP homepage also contains a CGI to Sybase to display information maintained in the Test Management Database (TMDB).

### **2.2.3 Java Development**

The initial prototyping effort using Java was recently undertaken to construct a query capability to support impact and trace analysis on the Integrated Requirements Database (IRDB). The IRDB Java applet is available through the IRDB homepage. The IRDB is a database containing EOSDIS Core System (ECS), Earth Sciences Data and Information System (ESDIS), and EOS Data and Operations System (EDOS) requirements and traces extracted from RTM baselines received by the IV&V team. If new Information System (IS) development is required in the future, Java will be given serious consideration for portability reasons.

### **2.2.4 Microsoft Access Development**

Two ISE infrastructure items, the Interface Analysis Database (IADB) and Data Management Database (DMDB), were developed in Microsoft Access. The IADB is still utilized in the performance of interface analysis activities. The DMDB is utilized to maintain information pertaining to COTS and Government Furnished Equipment (GFE).



### 3. Infrastructure Status and Proposed Action

#### 3.1 COTS Products

The ISE includes several COTS products. The table below provides a list of some of the more noteworthy COTS tools that are a part of the EOSDIS IV&V ISE infrastructure.

Tool Name (Vendor)	Platform/ Operating System	Short Description
BONeS (Cadence, Alta Group)	Sun/Solaris	Simulation and modeling tool.
ccMail (Lotus Software Corp.)	PC/Windows 95	Electronic mail system.
Centure Builder (Centura)	PC/Windows 95	4GL RAD Environment used to create 32 bit applications (upgrade from SQLWindows)
ClearCase (Rational)	Sun/Solaris	Configuration Management (CM) tool.
Jconnect (Sybase)	PC/Windows 95	Java Database Connectivity (JDBC) product providing Java applets access to a Sybase RDBMS
McCabe Toolset (McCabe & Associates)	Sun/Solaris	Code static analysis, test coverage, and metrics reporting toolset.
Microsoft Office (Microsoft)	PC/Windows 95	PC office software including word processor, spreadsheet, database, etc.
Netscape Communicator	PC/Windows 95	Internet browser and associated utilities.
Open Client (Sybase)	PC/Windows 95	Database connectivity product providing access from PC client applications to a Sybase RDBMS.
Rational Rose (Rational)	Sun/Solaris	CASE tool for analysis/design/reverse engineering.
RTM/Oracle (Integrated Chipware)	Sun/Solaris	Requirements Traceability Management (RTM) tool that uses an underlying Oracle RDBMS.
SQLNet (Oracle)	PC/Window 95	Database connectivity product providing access from PC client applications to an Oracle RDBMS.
SQLWindows (Centura)	PC/Windows 95	4GL RAD Environment used to create 16 bit applications
Sybase SQL Server (Sybase)	Sun/Solaris	Relational Database Management System (RDBMS)
Visual Café Pro (Symantec)	PC/Windows 95	Java RAD Environment used to create Java applets which can be executed through a WWW browser.
Xoftware (NetManage)	PC/Windows 95	PC X emulation tool so that X applications can be utilized in the PC environment.
Xrunner (Mercury Interactive)	Sun/Solaris	X capture/playback and test support tool.

**Exhibit 3.1-1 ISE COTS Products**

The information in the following table corresponds to the ISE COTS upgrade/change plan based upon existing information and on-going IV&V, I&T, and development activities.

<b>Tool Name (Vendor)</b>	<b>Current Version</b>	<b>Latest Version</b>	<b>Maint. Expiration</b>	<b>Upgrade/Change Plan</b>
BONeS (Cadence, Alta Group)	3.6	3.6	1/98	Upgrade when necessary for modeling and simulation activities.
ccMail (Lotus Software Corp.)	7.0	8.0	N/A	ccMail is being eliminated as the Intermetrics corporate mail system in favor of an IMAP server.
Centura Builder (Centura)	1.1.1	1.1.1	8/98	Upgrade as necessary to support tool development and maintenance activities.
ClearCase (Rational)	3.1.1	3.1.1	9/98	Upgrade as necessary to support tool development, EGS I&T, and IV&V activities.
Jconnect (Sybase)	2.0	2.0	8/98	Upgrade as necessary to support tool development and maintenance activities.
McCabe Toolset (McCabe & Associates)	5.2.3	6.0	7/98	Upgrade ASAP to resolve problems in parsing some of the ECS C++ source code.
Microsoft Office (Microsoft)	95	97	N/A	Upgrade as necessary to maintain currency with Intermetrics corporate.
Netscape Communicator	4.0.2	4.0.2	N/A	Upgrade as necessary to maintain currency with Intermetrics corporate.
Open Client (Sybase)	11.1.0	11.1.0	10/97	Upgrade as necessary to support tool development and maintenance activities.
Oracle RDBMS (Oracle Corp.)	7.1.4.1.0	7.3	1/98	Upgrade as required to support installed version of RTM.
Rational Rose (Rational)	4.0.15	4.0.15	3/98	Upgrade as new releases are made available from Rational due to existing inherent problems.
RTM (Integrated Chipware)	3.4	3.7	1/98	Upgrade when compatibility becomes an issue with ECS, EDOS, or ESDIS RTM baselines.
SQLNet (Oracle)	7.1	7.1	11/96	Upgrade as necessary to support tool development and maintenance activities.
SQLWindows (Centura)	5.0.2	5.0.3	8/98	Upgrade as necessary to support tool development and maintenance activities.
Sybase SQL Server (Sybase)	11	11.5	10/97	Upgrade ASAP due to newly added administrative tools.
Visual Café Pro (Symantec)	1.0e	1.0e	N/A	Upgrade as necessary to support tool development and maintenance activities.
Xoftware (NetManage)	5.0	7.0	8/97	Upgrade ASAP due to incompatibilities with X applications running on Sun Solaris.
Xrunner (Mercury Interactive)	4.0	4.0	6/98	Upgrade as necessary to support EGS I&T activities.

**Exhibit 3.1-2 ISE COTS Product Upgrade Plan**

## **3.2 Developed Client/Server Tools**

### **3.2.1 Automated Requirement Database (ARDB)**

The ARDB application allows geographically dispersed PC users to review baselined requirements and traces from ECS, EDOS, or ESDIS RTM releases and capture associated requirements analysis results. Support is provided for both the quantitative and qualitative analysis that is performed. Refer to the ISE Users Guide for additional detail regarding the tool and its utilization.

**Current Version:** 3.8b  
**Release Date:** 8/22/97

The following list delineates outstanding requests for ARDB enhancements and maintenance.

1. **High Priority** - Incorporate spell checking when a compatible spell checking Dynamic Link Library (DLL) is made available.
2. **High Priority** - Modify the Requirement Orphan Report to work off the Sybase ISE requirements table for the current RTM release. This is necessary because of the time that it takes to produce the report off the RTM/Oracle database.
3. **Low Priority** - Add the capability to perform ARDB functions for a single requirement and trace baseline against the ISE requirements and links table structure (in addition to existing support for RTM).
4. **Low Priority** - Change the windowing foreground and background colors to the Windows defaults.
5. **Low Priority** - Read the project graphic file symbol from a non project specific file name.

### **3.2.2 Project Issue Tracking System (PITS)**

The PITS application allows geographically dispersed PC users to capture, manage, and report issue data for an issue repository, or set of interoperable issue repositories. Currently, there is an IV&V issue repository and an ICWG issue repository. The tool provides an ad-hoc query capability and pre-canned metrics reports so that management can determine progress relative to issue resolution. Refer to the ISE Users Guide for additional detail regarding the tool and its utilization.

**Current Version:** 3.0  
**Release Date:** 9/17/97

The following list delineates outstanding requests for PITS enhancements and maintenance.

1. **High Priority** - Incorporate spell checking when a compatible spell checking Dynamic Link Library (DLL) is made available.
2. **Moderate Priority** - Port the 16 bit SQLWindows PITS application to a 32 bit Centura Builder application.
3. **Moderate Priority** - Change the issue form to take advantage of the Centura tab folder interface object for issue description, impact, and recommendation text entry. Modifications should mimic those incorporated into the International Space Station 32 bit version of the PITS.
4. **Low Priority** - Change the windowing foreground and background colors to the Windows defaults.
5. **Low Priority** - Read the project graphic file symbol from a non project specific file name.

### **3.2.3 Test Management Database (TMDB)**

The TMDB application allows geographically dispersed PC users to utilize a complete set of test support functions. These functions include test package definition, test method definition, test case definition, test procedure definition, test session definition, test execution result capture, and metrics/reporting. The TMDB provides a test oriented context for allocating requirements to packages, cases, and procedures and reports requirement validation status relative to the test execution results maintained in the database. Refer to the ISE Users Guide for additional detail regarding the tool and its utilization.

**Current Version:** 5.0  
**Release Date:** 9/18/97

The following list delineates outstanding requests for TMDB enhancements and maintenance.

1. **High Priority** - Incorporate spell checking when a compatible spell checking Dynamic Link Library (DLL) is made available.
2. **High Priority** - Add a PROGRAM column to the analyst table and other TMDB tables so that EGS I&T TMDB users only see EGS I&T TMDB data. This change would parallel the PITS implementation where display data is filtered based upon the user.
3. **High Priority** - Add a TMDB requirement load capability that would accept input from either MS Access or a carrot delimited file. The data content shall match the REQUIREMENTS table columns and data types.
4. **High Priority** - Review all uses of the SQLWindows TOKENIZE function. Replace the use of TOKENIZE in all places where deemed necessary by the task leader.
5. **High Priority** - Add a capability for the user to link a single requirement to a test package by entering the necessary requirement identification information.

6. **High Priority** - Add “Session Result Reporting” interfaces where data is filtered based upon operation specification of package and requirements filters and results are displayed in table form and sorted based upon operator specified sort criteria. Display data should be printable and a data export capability should be provided.
7. **High Priority** - Add a “Redundant Requirement Allocation” reporting mechanism showing requirements that have been redundantly allocated either at the package or test case level.
8. **Moderate Priority** - Add “Session Resource Conflict” and “Session Resource Utilization” reports.
9. **Moderate Priority** - Port the 16 bit SQLWindows TMDB application to a 32 bit Centura Builder application.
10. **Moderate Priority** - Provide a data export/import capability for session resources to promote transfer to and from project management tools such as Microsoft Project.
11. **Low Priority** - Change the windowing foreground and background colors to the Windows defaults.
12. **Low Priority** - Read the project graphic file symbol from a non project specific file name.

#### **3.2.4 Test Verification Database (TVDB)**

The TVDB application allows geographically dispersed PC users to capture test witnessing results in a database which includes ECS RTM requirement to test case mappings. The TVDB is, to some extent, a derivative of the TMDB in that it also reports requirement validation status based upon witnessed execution results. The major difference is that this tool imports Hughes test case and associated requirements mappings from an RTM baseline. Since version 1 test witnessing was not performed due to Version 1 cancellation, this tool has not been utilized. No users guide information has been included in the ISE Users Guide since this tool is very specific to the need that it was intended to address.

**Current Version:** 2.0  
**Release Date:** 1/17/97

No outstanding requests for TVDB enhancements or maintenance exist.

### **3.3 Homepage Development**

#### **3.3.1 EOSDIS IV&V Homepage**

The EOSDIS IV&V Homepage serves as a forum for disseminating information relative to EOSDIS IV&V activities to our primary customer, NASA GSFC personnel. It includes contact, library (IV&V deliverables), access statistics, and other pertinent information about the IV&V effort. Subordinate pages include the PITS WWW Browser homepage, the IRDB homepage, and the IADB homepage. With the exception of the PITS WWW

Browser and the new IRDB Java applet, no version information is maintained for the homepages since they are only a mechanism for disseminating information.

The following list corresponds to maintenance activities that are performed on a periodic or as needed basis.

1. The "Whats New" and "Contacts" areas are updated.
2. IV&V deliverables are posted to the appropriate LIBRARY area. Developed utilities are used to assist in updating the files that must be updated.
3. Other information points are updated as requested.
4. The EOSDIS IV&V and ICWG PITS WWW based report snapshots are updated on a monthly basis.
5. Update the IRDB homepage configuration information and reports as new RTM baselines are received for ECS, EDOS, or ESDIS.

Only one enhancement request that is listed as a **LOW PRIORITY** has been noted. A "Project Personnel/Tasking System" capability could be developed that would minimize manual maintenance of project homepages. Clerical people, not programmers, could then use the developed system to maintain currency for project staff. Homepages personnel contact and tasking information could then be displayed from a maintained database as opposed to the manual update approach that is currently in place.

#### **3.3.1.1 PITS WWW Browser Query Capability**

Version information for the PITS WWW Browser is maintained since it includes a query mechanism and data displayed via a CGI interface to the PITS Sybase database.

**Current Version:** 3.0  
**Release Date:** 12/20/96

The following list delineates outstanding requests for PITS WWW Browser enhancements and maintenance.

1. **High Priority** - Update the query and issue reporting capabilities to support the new issue to requirement and issue to test case relationship capabilities in the new PITS client/server that was released on 9/17/97.
2. **Moderate Priority** - Implement a Java applet that would build the PITS WWW Browser reports dynamically so that the most current status is always reported. Doing this would eliminate the monthly updates that are currently manually performed.

#### **3.3.1.2 IRDB Java Trace/Impact Analysis Query Capability**

Version information for this capability will be maintained since it includes a query mechanism and data displayed via a Java Database Connectivity (JDBC) interface to the IRDB Sybase database.

**Current Version:** 1.0 beta  
**Release Date:** 8/12/97

The following list delineates outstanding requests for enhancements and maintenance.

1. **High Priority** - Clean up the prototype and complete functional testing so that Version 1.0 can be released and the under construction display icon can be removed.

### **3.3.2 EGS I&T Homepage**

The EGS I&T Homepage serves as a forum for disseminating information relative to EGS I&T activities to our primary customer, NASA GSFC EOSDIS integration personnel. It includes contact, library (I&T deliverables), access statistics, and other pertinent information about the EGS I&T effort. A subordinate page, recognized as the Confidence Test Program (CTP) homepage, includes a CGI interface to the TMDB Sybase database. With the exception of the CTP Electronic File Cabinet (CTP-EFC), no version information is maintained for the homepages since they are only a mechanism for disseminating information.

The following list corresponds to maintenance activities that are performed on a periodic or as needed basis.

1. The “Whats New” and “Contacts” areas are updated.
2. I&T deliverables are posted to the appropriate LIBRARY area. Developed utilities are used to assist in updating the files that must be updated.
3. Other information points are updated as requested.

#### **3.3.2.1 CTP-EFC Capability**

Version information for the CTP-EFC is maintained since it includes a query mechanism and data displayed via a CGI interface to the TMDB Sybase database.

**Current Version:** 1.0  
**Release Date:** 11/15/96

The following list delineates outstanding requests for CTP-EFC enhancements and maintenance.

1. **Moderate Priority** - Update the CTP-EFC Perl scripts to only pull information for display that is associated with “approved” TMDB artifacts.
2. **Moderate Priority** - Update the CTP-EFC as necessary when TDMB table schema changes are deployed.

### **3.4 Microsoft Access Development**

The Interface Analysis Database and the Data Management Database are the only Microsoft Access applications that are being maintained as a part of the ISE infrastructure. Refer to the ISE Users Guide for additional detail regarding these tools and there utilization.

**IADB Current Version:** 1.0  
**IADB Release Date:** 9/5/96

There are no enhancement or maintenance requests pending for the IADB.

**DMDB Current Version:** 3.0  
**DMDB Release Date:** 10/15/96

There are no enhancement or maintenance requests pending for the DMDB.



#### **4. ABBREVIATIONS AND ACRONYMS**

Below is a list of the abbreviations and acronyms used in this document.

ARDB	-	Automated Requirements Data Base
BONeS	-	Block Oriented Network Simulator
CDR	-	Critical Design Review
CGI	-	Common Gateway Interface
COTR	-	Contracting Officer Technical Representative
COTS	-	Commercial Off-The-Shelf
CSMS	-	Communications and System Management Segment
CTP	-	Confidence Test Program
CTP-EFC	-	Confidence Test Program Electronic File Cabinet
DAAC	-	Distributed Active Archive Center
DBI	-	Data Browser Interface
DDTS	-	Distributed Defect Tracking System
DID	-	Data Item Description
DMDB	-	Data Management Database
EBnet	-	EOS Backbone Network
ECS	-	EOSDIS Core System
EDHS	-	ECS Data Handling System
EDOS	-	EOS Data and Operations System
EGS	-	EOS Ground System
EOS	-	Earth Observing System
EOSDIS	-	Earth Observing System Data Information System
ESDIS	-	Earth Science Data and Information System
ETS	-	EOSDIS Test System
FDF	-	Flight Dynamics Facility
FOS	-	Flight Operations Segment
FTP	-	File Transfer Protocol
GOTS	-	Government Off The Shelf
GS	-	Ground System
GSFC	-	Goddard Space Flight Center
GUI	-	Graphic User Interface
HAIS	-	Hughes Automated Information Systems
HITS	-	Hughes Information Technology Systems
HTML	-	Hyper Text Markup Language
HTTP	-	Hyper Text Transport Protocol
IS	-	Information System
I&T	-	Integration and Testing
IADB	-	Interface Analysis Database
ICWG	-	Interface Control Working Group
ICD	-	Interface Control Document
IIR	-	Integrated Information Repository
IR1	-	Interim Release 1

IRD	-	Interface Requirement Document
ISE	-	Integrated Support Environment
IV&V	-	Independent Verification and Validation
JDBC	-	Java Data Base Connectivity
LAN	-	Local Area Network
M&O	-	Maintenance and Operations
N/A	-	Not Applicable
NASA	-	National Aeronautics And Space Administration
NOAA	-	National Oceanic and Atmospheric Administration
OMT	-	Object Modeling Technique
PAR	-	Performance Assurance Requirements
PC	-	Personal Computer
PDF	-	Portable Document Format
PDR	-	Program Design Review
PITS	-	Project Issue Tracking System
PS	-	Postscript
RAD	-	Rapid Application Development
RAPID	-	Rapid Application Prototyping and Incremental
Development		
RBR	-	Requirements By Release
RDBMS	-	Relational Data Base Management System
RID	-	Review Item Discrepancy
RTF	-	Rich Text Format
RTM	-	Requirements Traceability Management
SCDO	-	Science and Communications Development Office (ECS)
SCF	-	Science Computing Facility
SDPS	-	Science Data Processing Segment
SMO	-	System Management Office
SOW	-	Statement Of Work
SQL	-	Structured Query Language
STD	-	Standard
StP	-	Software through Pictures
TAM	-	Technical Analysis Memorandum
TAR	-	Technical Analysis Report
TBD	-	To be determined
TBS	-	To be supplied
TIM	-	Technical Issue Memorandum
TMDB	-	Test Management Data Base
TRMM	-	Tropical Rainfall Measurement Mission
TVDB	-	Test Verification Database
TXT	-	ASCII Text
V&V	-	Verification and Validation
WAN	-	Wide Area Network
WVU	-	West Virginia University
WWW	-	World Wide Web

